

A Herpetofaunal Inventory of Homestead National Monument of America

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Summary

Homestead National Monument (NM) of America was surveyed to determine current species composition, distribution, and abundance during the spring/summer seasons of 2002 and 2003 via general visual searches, cover boards, drift fence with funnel traps, amphibian call surveys, and turtle traps. An expected species list incorrectly listed two amphibians and three reptiles due to incorrect species range and/or habitat requirements. Upon revising this list, the inventory yielded 86% of the amphibians (6 of 7) and 69% of the reptiles (9 of 13). One amphibian and four reptiles, originally listed as expected, are now considered extirpated; status of four herpetofauna are questionable; and one reptilian species was added to the list. Undeveloped portions of the watershed retain a rich diversity and abundance of herpetofauna. Current good management practices and our proposed recommendations should insure long term viability of sustainable populations of herpetofauna within Homestead NM of America.

Acknowledgments

This survey was part of a larger project involving three National Park Service units. Surveys at these three parks were an enormous task for one person, and they could not have been efficiently completed without the assistance of several individuals and organizations. George Cunningham, Ted Leonard, and Tracy Patten, all of Omaha, Nebraska, provided field assistance on nearly all occasions. The University of Nebraska-Omaha (UNO) Office of Sponsored Projects was extremely helpful and supportive in getting an agreement reached with the Cooperative Ecosystem Studies Unit (CESU) at the University of Nebraska – Lincoln, and Tom Bragg of UNO graciously agreed to act as the Primary Investigator for this project so it could be handled via the CESU. Thanks to the park personnel in providing lists of species already identified as well as locations of where some species can regularly be found. Finally, a note of thanks to Gia Wagner, natural resource manager at Pipestone National Monument, who recommended me for this project, and Michael Williams, who was very understanding and afforded me extended time to thoroughly complete this report. Also thanks to the Heartland Network Inventory and Monitoring Program for funding the project.

Introduction

Congress passed the National Parks Omnibus Management Act in 1998 in response to concerns about the condition of natural resources within the national parks. The act requires each park to gather baseline inventory data on pertinent natural resources, data that will provide a pivotal step toward establishing an effective monitoring program furthering the ability to effectively manage and protect park resources and abide by the National Park Service (NPS) mission statement. The NPS responded with the Natural Resource Challenge program, including the establishment of biome-based inventory and monitoring networks. The Heartland Network, as part of the NPS Inventory and Monitoring (I&M) program, has undertaken inventories of vascular plants and vertebrates within fifteen parks in eight Midwestern states. Stemming from this challenge and a widespread concern regarding the status of herpetofauna populations at Homestead NM of America, a comprehensive inventory was deemed necessary to establish baseline data of herpetofaunal resources within the park.

The decline of herpetofaunal species worldwide is a widely known phenomenon. The cause of declines is largely unknown but is likely a combination of habitat loss/alteration, environmental degradation, human persecution, and increased predation. Amphibians' biphasic lifecycles and permeable skin make them particularly susceptible to local hydrologic modifications and environmental pollutants and make them potential indicators of environmental health.

Prior to this inventory, the status of these species within Homestead NM of America was unknown although range maps indicate numerous species could occur at the park.

Inventories will contribute to a better understanding of the factors that maintain and preserve park ecosystems, potential impacts from land use, and opportunities for monitoring population trends in species identified as indicators of environmental change.

The objective for this inventory was the documentation of 90% of reptile and amphibian species reasonably expected to occur at Homestead NM of America. The goals included providing an assessment of species richness and collecting voucher photo records for each herpetological taxon.

Study Area

Homestead NM of America is located in southeastern Nebraska (Gage County) just west of the City of Beatrice (Figure 1). The property consists of 79 ha (195 ac) including; 40.5 ha (100 ac) of restored tallgrass prairie, 24.3 ha (60 ac) of hardwood forest, and 1.2 ha (3 ac) of administrative areas (roads, structures, and trails). The park is dissected by Cub Creek throughout the west end of the property.

Habitat at the park consists primarily of two types: restored tallgrass prairie and riparian woodlands. There are no naturally occurring rock outcrops. There are no permanent lentic habitats however Cub Creek provides a permanent lotic habitat. Several lowland depressions form temporary seasonal wetlands during wet springs.

Materials and Methods

Homestead NM of America was surveyed to determine current species composition, distribution, and abundance during the spring/summer seasons of 2002 and 2003 via general visual searches, cover boards, drift fence with funnel traps, amphibian call surveys, and turtle traps.

The primary method used to survey amphibians and reptiles was the visual encounter survey. These surveys were conducted along the park's extensive trail system as well as along the banks of Cub Creek. Walking through recently burned areas after prescribed fires proved to be an exceptionally productive method for finding both living specimens and individuals that had been killed by fires.

Due to the lack of natural cover objects, artificial cover boards were used to potentially attract snakes, lizards, and amphibians (Figure 2). Twenty-two 2.0 x 2.0 ft cover boards cut from 7/16 in oriented strand board (OSB) were placed throughout the park, with most of them being placed in restored prairie habitat. Cover boards were checked during each visit to the park.

A single drift fence with funnel traps was constructed during the 2003 season. Because of constraints imposed by park personnel, drift fences could only be placed in areas where they would not be visible to park visitors because they reduced the aesthetic quality of the prairie. Therefore the only possible and practical location for drift fence construction was the center of that portion of restored prairie that was not scheduled for a prescribed fire. The drift fence was approximately 70.0 ft in length and composed of 24.0 in silt fence material with wood stakes at 10.0 ft intervals. Six funnel traps were employed – two on each end of the fence and two at approximately the midpoint of the fence on either side. Traps were checked once weekly from early May through late June 2003.

Amphibian call surveys were also conducted during spring/summer 2002 and 2003. Since the park closed before sunset, call surveys during 2002 were conducted from the bridges over Cub Creek located on Nebraska Highway 4 and on the gravel road west of the park. In 2003, an automated recording system was used to record frog and toad calls within the park.

To sample for aquatic turtles, baited turtle traps were set in Cub Creek just outside the park property in Cub Creek at the southwest border. Turtle traps were set during June and July 2003.

Each primary point was recorded (NAD83) using a Magellan Meridian Gold Global Positioning System (GPS) portable hand-held unit with an accuracy of three meters or less.

Voucher photos were taken for each species (where possible).

Results

An expected species list incorrectly listed two amphibians and three reptiles due to incorrect species range and/or habitat requirements. Upon revising this list, the inventory yielded 86% of the amphibians (6 of 7) and 69% of the reptiles (9 of 13) (Tables 1). One amphibian and four reptiles, originally listed as expected, are now considered extirpated. Status of four herpetofauna are questionable. One reptilian species was added to the list.

Total number of species observed is found in Table 2 and locations of where herpetofauna were found are provided in Figures 3-6.

Discussion

Homestead NM of America has a moderately rich number of species as compared to the surrounding agricultural counties. However, there are no outstanding features on the landscape (i.e. rock outcrops, wet meadows, etc.) that would attract any more species than are already present.

Only anuran amphibians were encountered, and some of these were identified by call only. A single burned specimen of a Cope's gray treefrog (*Hyla chrysoscelis/versicolor*) was found after a prescribed fire in May 2003, and one live specimen was found sleeping inside a small tree hole at the edge of a small wooded temporary wetland. Calling Cope's gray treefrogs were heard on several occasions, however the choruses were never very large in number, often numbering only two or three individuals. Large choruses of western chorus frogs (*Pseudacris triseriata*) and northern cricket frogs (*Acris crepitans*) were heard on several occasions, and a few individual calls of Woodhouse's toads (*Bufo woodhousii*) were heard occasionally. Bullfrogs (*Rana catesbeiana*) and plains leopard frogs (*Rana blairi*) were never heard calling, however they were sighted at several locations along Cub Creek. Several Woodhouse's toads were also found during visual encounter surveys along the park's trail system. An automated recording device ("Frog Logger") was placed at two locations in the park on two different occasions. The first was from 25-30 May 2003, which recorded the calls of Cope's gray treefrogs, northern cricket frogs, and Woodhouse's toads for five evenings in a row. The second occasion was from 15-21 June 2003. Only northern cricket frogs and Cope's gray treefrogs could be heard on those evenings. The only larval amphibians encountered were bullfrog tadpoles, which could be seen in Cub Creek from the hiking trail. During September 2002, newly metamorphosed plains leopard frogs and bullfrogs were seen on the banks of Cub Creek.

Only one temporary wetland that was large enough to support amphibian reproduction was found. During the 2002 season the wetland was dry by early May and in 2003 it had dried up by late May. If amphibians had used this habitat for breeding, most larvae would have perished before having the opportunity to metamorph. Park personnel spoke of several other small wetlands located just south of the visitor's center on the west side of Cub Creek, and choruses of western chorus frogs could be heard calling from this area, but the wetlands quickly dried up. This may be an artifact of recent drought in southeastern Nebraska and the wetlands may last longer during years with increased precipitation.

Most reptiles were encountered during visual encounter surveys, although artificial cover boards worked exceptionally well in the restored prairie. Boards placed in woodland habitat were never successful in attracting reptiles or amphibians. Because the hiking trail is well manicured and vegetation is maintained at a low height, it served as a site for early day basking for snakes. It also served as a feeding station for several Woodhouse's toads which could be found at the edge where the trail meets the prairie. Both the common and plains garter snakes (*Thamnophis sirtalis* and *T. radix*) were found basking on the trail, as well as racers (*Coluber constrictor*) and one bullsnake (*Pituophis catenifer*). These species as well as all other snakes were also found utilizing the cover boards. No lizards were encountered during this survey.

A late spring season prescribed fire on the western third of the restored prairie afforded the opportunity to conduct visual encounter surveys for both living and burned reptiles and amphibians. Several common and plains garter snakes were found alive basking on the recently cleared soil, and numerous specimens of common garter snakes, plains garter snakes, lined snakes (*Tropidoclonion lineatum*), and brown snakes (*Storeria dekayi*) were found to have succumbed to fire. At least 15 snakes and two amphibians (one frog and one toad) were found dead during a two-hour search of the burned prairie.

The single drift fence was in place for six weeks, however because of its location, success rates were dismal. Only two plains garter snakes were captured. Several mammals were captured, however, including the western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Peromyscus maniculatus*) and the masked shrew (*Sorex cinereus*).

Cover boards were checked at the end of 2002 and all throughout 2003. These were effective for turning up living specimens of smaller and more fossorial snakes such as the lined snake and the brown snake. They also provided cover for a bullsnake and a northern water snake (*Nerodia sipedon*) as well as both species of garter snakes, racers, and several species of small mammals.

Only aquatic turtles were encountered at the park, and these were primarily found either by scanning the stream banks along Cub Creek or by setting an aquatic turtle trap. One trap was set on two occasions beneath a bridge that crosses over Cub Creek at the southwest corner of the park. Five turtles of three species were captured. Most other sightings were of turtles basking on the banks of Cub Creek, although two newly hatched young-of-the-year common snapping turtles (*Chelydra serpentina*) were found in the grass near the visitor's center.

Expected Species

Absent species that were expected based on published literature (Lynch 1985), University of Nebraska State Museum records for the northern two thirds of Gage County, and an expected species list (Boetsch et al 2000) are discussed below in detail. Although target species lists were provided for each park by NPS personnel, these lists were compiled using general, large-scale regional field guides and thus may not be considered the most accurate accounts of species distributions. Modified target species lists were produced by the investigator using local field guides journal publications (Lynch 1985) and museum records.

Tiger Salamander (*Ambystoma tigrinum*)

Tiger salamanders are believed to have a statewide distribution in Nebraska and have been found in such diverse habitats as mammal burrows, cattle tanks, stock ponds, vernal wetlands, and even in the basements of human dwellings. They seem to be able to withstand severe degradation of habitat quality and still thrive. Their absence from this survey is confusing, because the park appears to have suitable habitat in the form of a restored native tallgrass prairie, and an adjacent property to the east has a small impoundment that could easily serve as breeding habitat. Several small- to medium-sized mammal burrows were found on the eastern end of the park property, and at least one large badger burrow exists there as well. All of these are appropriate as summer retreats for salamanders. To successfully sample an area for salamanders, however, often requires sampling aquatic habitats for their larvae. Salamanders generally require ponds or

wetlands that are devoid of large predatory fish, such as bass or trout. Cub Creek is not a suitable breeding site for salamanders because of the introduction of bass to the stream, although it is possible that some salamanders may successfully breed there. Larvae were never seen in the stream. Since none of the temporary ponds in the park held water long enough to allow prolonged development of larvae, sampling for salamander larvae could not be accomplished. It is likely that salamanders still survive in the park, although there is a chance that they have been extirpated. Recent trends in other agricultural areas are showing a decline in salamander sightings (James Christiansen, Professor, Drake University), possibly due to herbicide/pesticide use as well as the damming of small streams and the introduction of previously non-existent predators such as bass. Future survey efforts should concentrate on searching for salamander larvae in one of the several small temporary wetlands as well as looking for migrating salamanders during early spring (March-April) rain events.

Great Plains Toad (*Bufo cognatus*)

While the Great Plains toad is predominantly a resident of short to mixed-grass prairies, it has been found in the tallgrass prairie region of eastern Nebraska. Current museum records are scarce but this species of toad appears to suffer from the effects of grassland conversion to agriculture, especially in the tallgrass region. I have been working in Gage County for seven years and have only found one Great Plains toad during that time. All records for Gage County come from the southern fourth of the county, south of Wymore, Nebraska. The nearest record to the park comes from Lincoln, Nebraska approximately 60 miles to the north. Further inventory methods should include continued anuran call surveys to ascertain whether this species exists on park property, however given its preference for more pristine habitat, and the extensive row crop farming that occurs around the park, it has probably long been extirpated from the area.

Ornate Box Turtle (*Terrapene ornata*)

Ornate box turtles have been found recently in southern Jefferson County to the south and west of the park, however these turtles have been absent from Gage County since the 1930's. According to Lynch (1994), the general distribution of ornate box turtles in Gage County is not expected to extend north of Wymore. They are predominantly residents of short to mixed-grass prairies due to the dry, sandy substrate in these regions. They are rarely found in true tallgrass prairies but have been found in isolated fragments of dryer, more sandy habitat within the tallgrass prairie region, such as the Loess Hills of western Iowa. It is doubtful that ornate box turtles ever naturally occurred at the park, but if they did, they have long since disappeared from the landscape. They are conspicuous residents in any place they occur, and would commonly be seen and reported by visitors and park personnel. It is possible that visitors may release an occasional captive on the park grounds, and park personnel have reported finding what they believed to be an ornate box turtle carcass after a prescribed fire, however the carcass was not available for identification and if it did happen to be a box turtle, it was most likely a released animal rather than a naturally-occurring one.

Smooth Softshell Turtle (*Apalone mutica*)

Smooth softshell turtles are fully aquatic residents of large streams and rivers. Specimens have been found in the Big Blue River as far north as DeWitt, Nebraska north and west of the park, and I have found them below a dam site in Barneston, Nebraska to the south. Although the Big Blue River is relatively close to the park and Cub Creek is a tributary, this turtle was not found in

Cub Creek. It is possible that during certain years of high water in the creek, smooth softshell turtles may venture out of the Big Blue River and into Cub Creek, but they are not likely to be permanent residents and will certainly not reproduce within the confines of Cub Creek. I do not believe that the smooth softshell is a permanent resident of Homestead NM of America but may be an occasional temporary migrant.

Six-lined Racerunner (*Cnemidophorus sexlineatus*)

Only a single six-lined racerunner has ever been recorded from Gage County, and it was found in the vicinity of Beatrice in 1975. None have been found since, and I have searched in several areas that appear to have optimal habitat. The only other lizard to ever be found in Gage County was a Great Plains skink (*Eumeces obsoletus*) found in southern Gage County near Liberty, Nebraska in 2000. The lack of lizards (or lizard specimens) in this part of Gage County is a bit of a mystery. Several other herpetologists (Lynch, Hudson, Taylor) have worked extensively in Gage County and yet only two lizard specimens have ever been uncovered. Six-lined racerunners have been found in Kansas within 2.0 miles south of the Gage County, Nebraska border, and they have been found in the southern part of adjacent Jefferson County. The six-lined racerunner prefers to inhabit dry, sandy open areas with very little ground vegetation. It has striking colors, is active during the hottest times of the day, and is clearly noticeable wherever it occurs because it moves rapidly to cover when disturbed. The habitat at the park is not optimal for this species of lizard, regardless of how rare it may be in Gage County. Therefore I would suggest that the six-lined racerunner is not and probably never has been present in the park.

Ringneck Snake (*Diadophis punctatus*)

In Nebraska, ringneck snakes are residents of the more mesic regions in the eastern part of the state (Lynch 1985). Their westward occurrences are closely tied to the major river systems (Missouri, Niobrara, Loup, Platte, and Republican Rivers). Along the Big Blue River, ringneck snakes extend as far north as approximately Beatrice. Lynch (1994) predicts that their distribution stops there and does not follow the Big Blue River to its source, although he does not suggest a reason for this. Ringneck snakes are small, fossorial, and secretive snakes that rarely occur above ground. Their distribution is extremely patchy, but wherever they occur, they occur in fairly large numbers (Fitch 1975). Cover objects are necessary to attract them, however none of the cover boards at the park ever turned up a ringneck snake. Several boards were placed at riparian woodland edges specifically to survey for this species. Other species, including the equally small and fossorial lined snake, were found, therefore the boards were functional. It is possible that Homestead NM of America is slightly outside the range of ringneck snakes, and that without optimal habitat they cannot survive there. A permanent array of artificial cover objects over several years would best determine whether these snakes occur at this park.

Western Rat Snake (*Elaphe obsoleta*)

The western rat snake is a large, semi-arboreal snake that is comfortable around human activity. These snakes are especially abundant around barns and other animal enclosures where they feed on rodents, birds, and bird eggs. In a more natural setting, western rat snakes are true woodland inhabitants. In southern Gage County, they are abundant along the limestone ledges and riparian woodlands that occur on the banks of the Big Blue River. In this region they can commonly be found beneath discarded sheets of tin and wood. Further north along the river, however, they are

significantly less common. I have found specimens killed on the road less than 10.0 miles from the park on Nebraska Highway 4 just east of Beatrice, however none were found in the park. I have also found them near Wilber, Nebraska, which is more than 15.0 miles north and west of the park. Interviews with park personnel indicate that western rat snakes have never been seen on the property. Given the large size and somewhat aggressive behavior of this snake, if it was seen by an employee or a visitor it would be a memorable experience. Since no sightings have ever been reported, this species probably does not occur at the park at this time.

Prairie Kingsnake (*Lampropeltis calligaster*)

As its common name implies, the prairie kingsnake is a resident of prairies as well as rocky hillsides. Homestead NM of America is well within the predicted range of this snake in Nebraska, and the current habitat at the park is ideal. This species, however, is relatively sensitive to dramatic landscape-level changes. Presently, the only populations that still exist live in regions where tracts of undisturbed, native tallgrass prairie still stand. Given that the park is a restored prairie and the surrounding properties have not been in a native condition for several human generations, prairie kingsnakes have probably been extirpated from the region. A specimen (living or dead) has not been found in Gage County in more than 25 years, thus the prairie kingsnake may be completely extirpated from the county.

Milk Snake (*Lampropeltis triangulum*)

Although they have not been reported from every county in the state, milk snakes are thought to have a statewide distribution. They have been found in a variety of habitats and are locally abundant in some areas of Nebraska. Although they are fairly large for a fossorial snake, they are still virtually undetectable during visual encounter surveys. I have found dozens of specimens in Jefferson and Thayer Counties to the southwest by searching beneath rocks in spring and fall, however during the summer they are rarely encountered above ground. In a grassland environment they can be attracted to artificial cover, and I have had success with this method in other grassland surveys. Only a single milk snake has ever been found in Gage County, and it was found in 1955 south and east of Beatrice. In several years of working on rocky hillsides in southern Gage County, I have never found a single milk snake. It is possible that they either do not exist in this region or are extremely rare as a result of early 20th century habitat conversion, occurring only in a few highly fragmented parcels of native grassland. Continuing a monitoring array of cover boards and possibly large sheets of tin, or surveying burned fields for several days after a prescribed fire may eventually turn up a specimen.

The original expected species list listed five species not found during this inventory. One was out of range, three were absent due to lack of habitat, and one due to both.

Green toad (*Bufo debilis*)

This species barely gets into Kansas and is a true southwestern species well over 300 miles out of range.

Western narrowmouth toad (*Gastrophryne olivacea*)

This species is only known from two or three locations within 6 miles of the Kansas border. Current inventories focus on looking for additional populations for the Nebraska Game and Parks Commission, however they are not expected to be found outside of the limestone bluffs

regions of southeastern Nebraska. At Homestead NM of America, this species is both out of range and lacking proper habitat.

Slender glass lizard (*Ophisaurus attenuatus*)

Glass lizards have only been found in two sites within the entire state of Nebraska, and a specimen has not been officially found since the 1940's. Currently, no habitat exists for this species at the park but it was likely on the ground there prior to agricultural conversion, since it is a true inhabitant of undisturbed tallgrass prairies. Recently it has been found that this species can survive in degraded tallgrass pastures, however the land surrounding the park has been in production for so long that this species has probably been extinct in northern Gage County for most of the last century.

Common kingsnake (*Lampropeltis getula*)

Kingsnakes are the rarest snakes in Nebraska, mostly due to their requirement for wet meadows. Until 2003, they were only known from a single location in the state. Last year, a specimen was found in Jefferson County and another in Nemaha County. This is another of those species that barely gets into the state and its distribution hugs the Kansas border. The habitat at the park may have supported them at one time – again, prior to conversion – however they are not expected to be within more than five miles into the state in Gage County.

Massasauga (*Sistrurus catenatus*)

Massasaugas share the same habitat preferences as kingsnakes, and the same information applies. Reports of massasaugas from Plymouth, Nebraska, which is only eight miles away from the park, were investigated but the reports proved to be a case of mistaken snake identity. It is likely that massasaugas (as well as king snakes) were once residents of most of the tallgrass prairie region of eastern Nebraska, however row crop farming, draining wet meadows, and construction of impoundments along streams have all contributed to their demise. The habitat no longer exists at the park and there are no surrounding populations from which individuals could emigrate.

Monitoring

A permanent array of artificial cover objects strategically placed throughout the park is the best way to monitor terrestrial reptile diversity. While wood cover boards are effective, they tend to disintegrate after a few years and can also easily succumb to grassland fires. Corrugated metal (tin) sheets have been shown to be highly effective in both grassland and grassland-edge environments, and they will last indefinitely. The major problem with using artificial cover is that, after a burn, they are clearly visible to park visitors and are not very aesthetically pleasing. Their function however, and their success should far outweigh the few weeks of unsightliness that result from their presence on the ground. Also, several can be placed in other areas besides the grassland, such as on the banks of Cub Creek. These might attract more of the woodland and woodland-edge species (such as western rat snakes) that were not found during the survey.

Call surveys should also be conducted at strategic locations in the park. Since park personnel are familiar with the grounds, they would know where wetland depressions occur during spring rainy seasons. Call surveys should be concentrated in these areas because they are preferred breeding

sites for nearly all amphibians, including salamanders. Ponds and streams with fish provide a threat to tadpoles, and amphibians generally avoid these habitats whenever possible. Anuran surveys at Homestead NM of America should begin in mid-April and continue until late June.

A monitoring method that can be used at Homestead NM of America is similar to one that is already in place at many natural areas across the country: a daily visitors log. Birdwatchers have used this technique for years to monitor not only the presence of bird species but also the time of year that they actually arrive on the grounds. This method could work equally as well for amphibians and reptiles. Visitors to the parks should be encouraged to record sightings of all wildlife observed in the park. A daily log or register should be placed in visitor's centers for just such a purpose, and park personnel should record these data annually. With the advent of the digital camera, visitors might also be encouraged to photograph herpetofauna and share those photos with the park, especially since the average visitor will be unable to identify most species.

Also, regional educators and herpetological societies should be encouraged to visit parks annually to conduct surveys. Many educators at the high school and college level are desperate to find such opportunities and may welcome the invitation with enthusiasm. Several high school science teachers have become active in stream monitoring activities and might easily be convinced to monitor terrestrial fauna that occur adjacent to streams.

Finally, as a minimum all park personnel who are active outside on park grounds should be trained in the identification of all indigenous herpetofauna, including frog and toad calls. Small, park-specific field guides can be produced at a relatively low cost, and these can become invaluable tools for park employees as well as visitors. Not only will they help untrained persons to identify amphibians and reptiles, but they will inform them which species are present in the park. A photo array of many of the native flora and fauna species on display works well because people always like to know what they are looking at and what they can potentially see. Often times it causes them to look specifically for a certain species. Therefore a park-specific field guide and checklist should be available – either at a nominal cost or for free – to all visitors of the parks. If this becomes an option in the future, I will be glad to provide photographs of all species.

Conclusion

The gathering of herpetofauna inventory data is a pivotal step toward establishing an effective monitoring program thereby furthering the ability to effectively manage and protect these resources and abide by the NPS mission statement. Based on this inventory the following management actions are recommended.

To ensure that current levels of herpetofaunal diversity do not drop, and to determine whether some of the missing species actually occur on National Park properties, monitoring efforts should be conducted for each park. For the most part, these efforts may require an initial investment in time and money, however later efforts should be relatively passive and should require only minimal amounts of time.

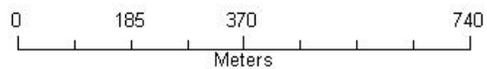
The restored prairie at Homestead NM of America is rich with tallgrass prairie species because of an effective fire regime. This management practice has also benefited amphibian and reptile species that rely on tallgrass refugia to persist. The only recommendation that I would suggest regarding the burn regime is that spring burns be conducted much earlier than mid-May. While patrolling the recently burned patch of prairie in late May 2003, a fair number of burned snakes, frogs, and toads were encountered. Even more alarming was the number of ground-nesting birds whose nests were destroyed in the fire. I realize that if the objective is to burn a certain section of prairie during the spring season that there is a fairly large window of opportunity during which it can be accomplished. However once most of the fauna have emerged from wintering areas and become active on the prairie, managers should consider abandoning plans for fire rather than trying to quickly complete the burn by the end of the window. Also, managers might consider adding a mowing or haying regime to simulate grazing in between fire years or when fires cannot be conducted due to climatic conditions. Since this is performed later in the year (summer), there is less of a chance that slow-moving, recently emerged reptiles will be killed, and ground-nesting birds will have already fledged.

Additional management recommendations are directed toward the few temporary wetlands and the riparian woodland community. The largest temporary wetland has become overgrown with woody vegetation. The water demands of these trees and shrubs is extreme, and they are rapidly draining water from the wetland. Removing most of these trees and shrubs would allow water to be retained longer and would definitely benefit the amphibian species that reproduce here. Their larvae will be able to complete their developmental cycles and metamorph into terrestrial forms. All other small temporary wetlands in the park should be managed the same way. In the riparian woodlands, clearings should be encouraged so that canopy gaps could open up and provide more light within the woodlands. Historically, grassland fires would continue on to riparian areas and remove much of the secondary growth woody vegetation. This is probably not practical; however removing some of the secondary growth trees from the landscape can simulate these results. Much of this is already being accomplished and I would recommend that monitoring of cleared areas be conducted to determine what benefits (if any) this action has afforded.

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Homestead NM of America



Gage County, Nebraska



1:9,000

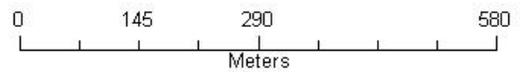
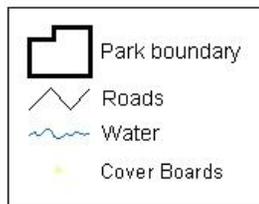
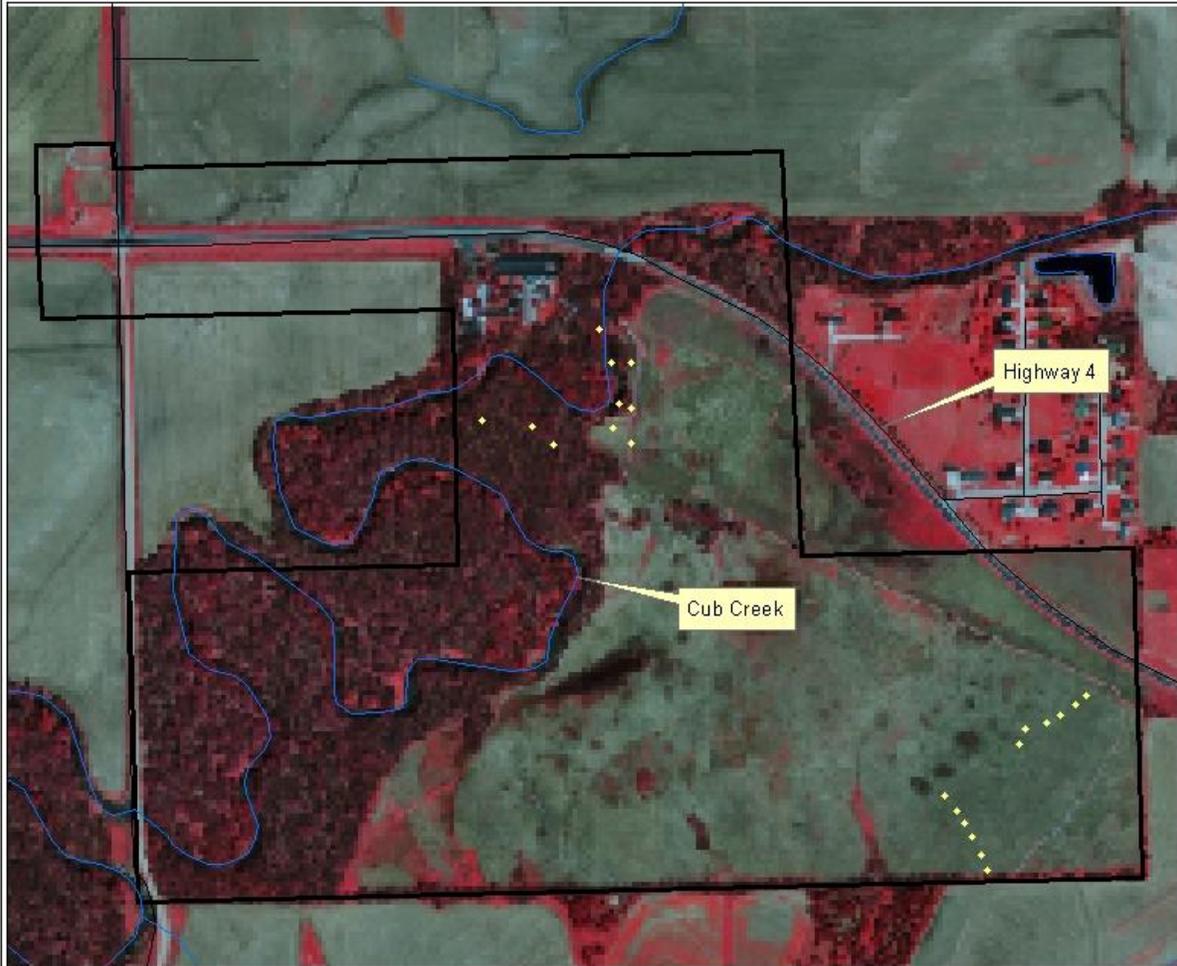


Map Produced by: Heartland Network
Inventory and Monitoring Program

Data Source: National Park Service

Figure 1. Location of Homestead NM of America, Gage County, Nebraska.

Homestead NM of America



1:7,000

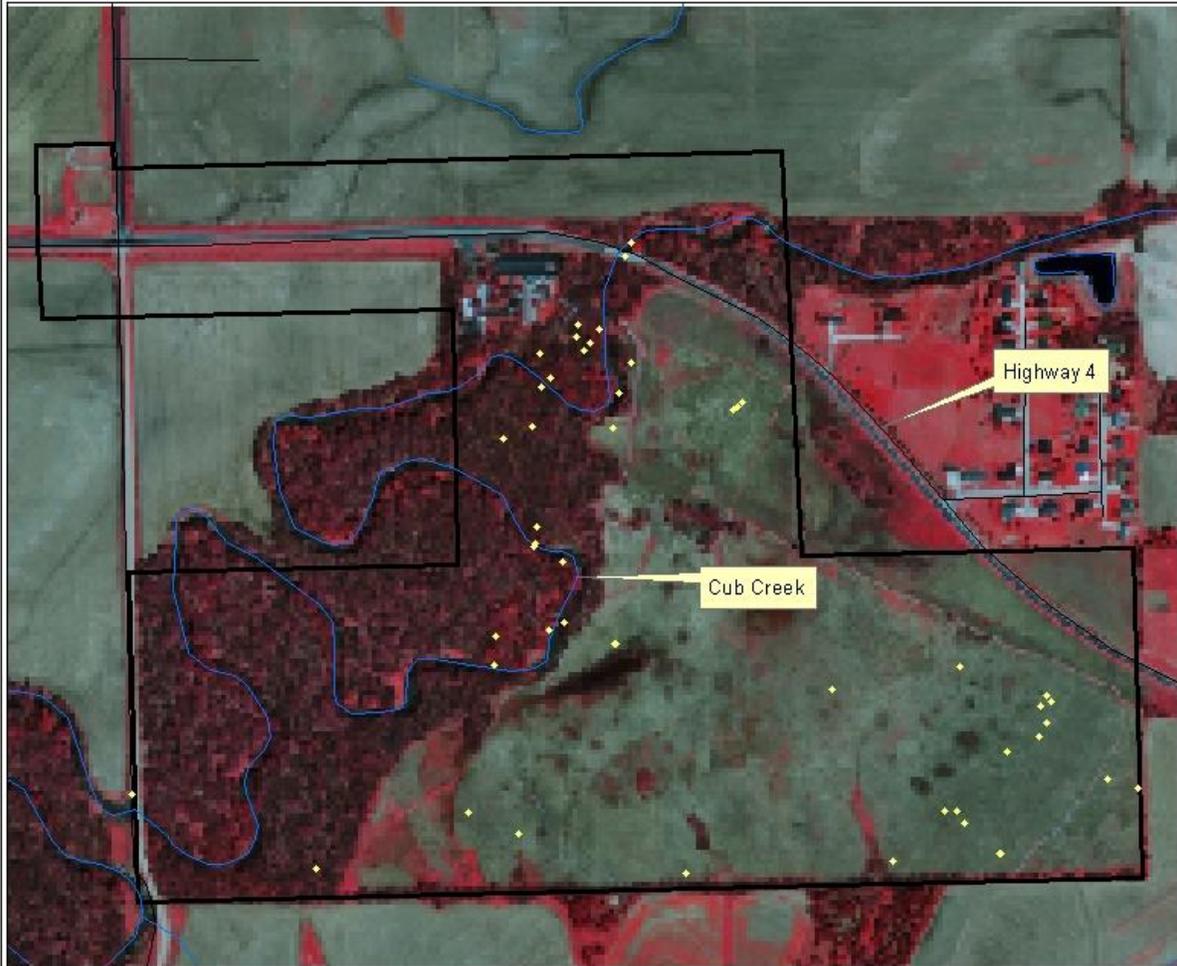


Map Produced by: Heartland Network
Inventory and Monitoring Program

Data Source: National Park Service

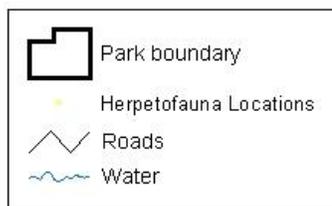
Figure 2. Location of herpetofaunal cover boards at Homestead NM of America.

Homestead NM of America



0 145 290 580
Meters

1:7,000



Map Produced by: Heartland Network
Inventory and Monitoring Program

Data Source: National Park Service

Figure 3. Distribution of herpetofauna locations at Homestead NM of America.

Homestead NM of America

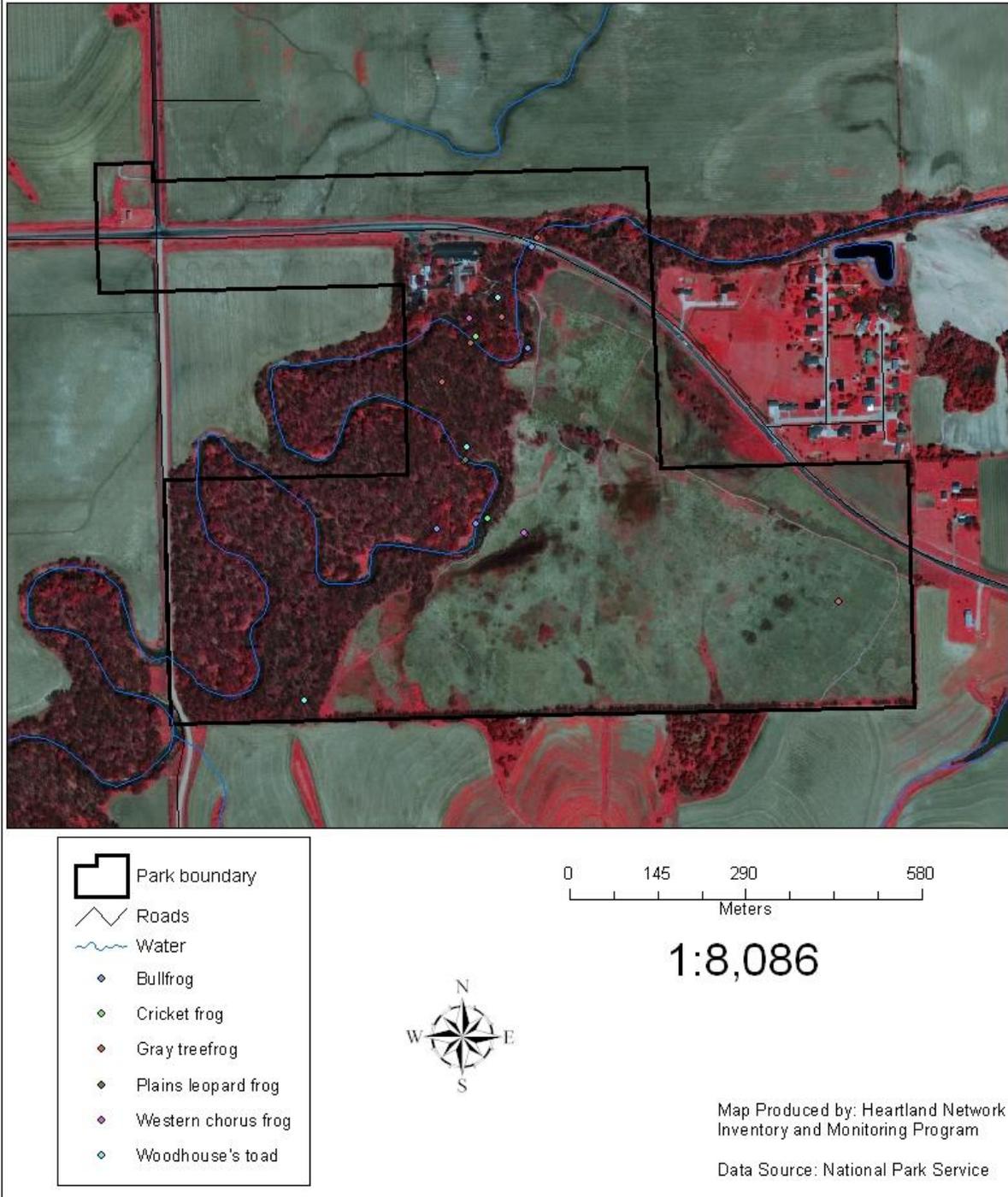


Figure 4. Distribution of amphibians documented at Homestead NM of America.

Homestead NM of America

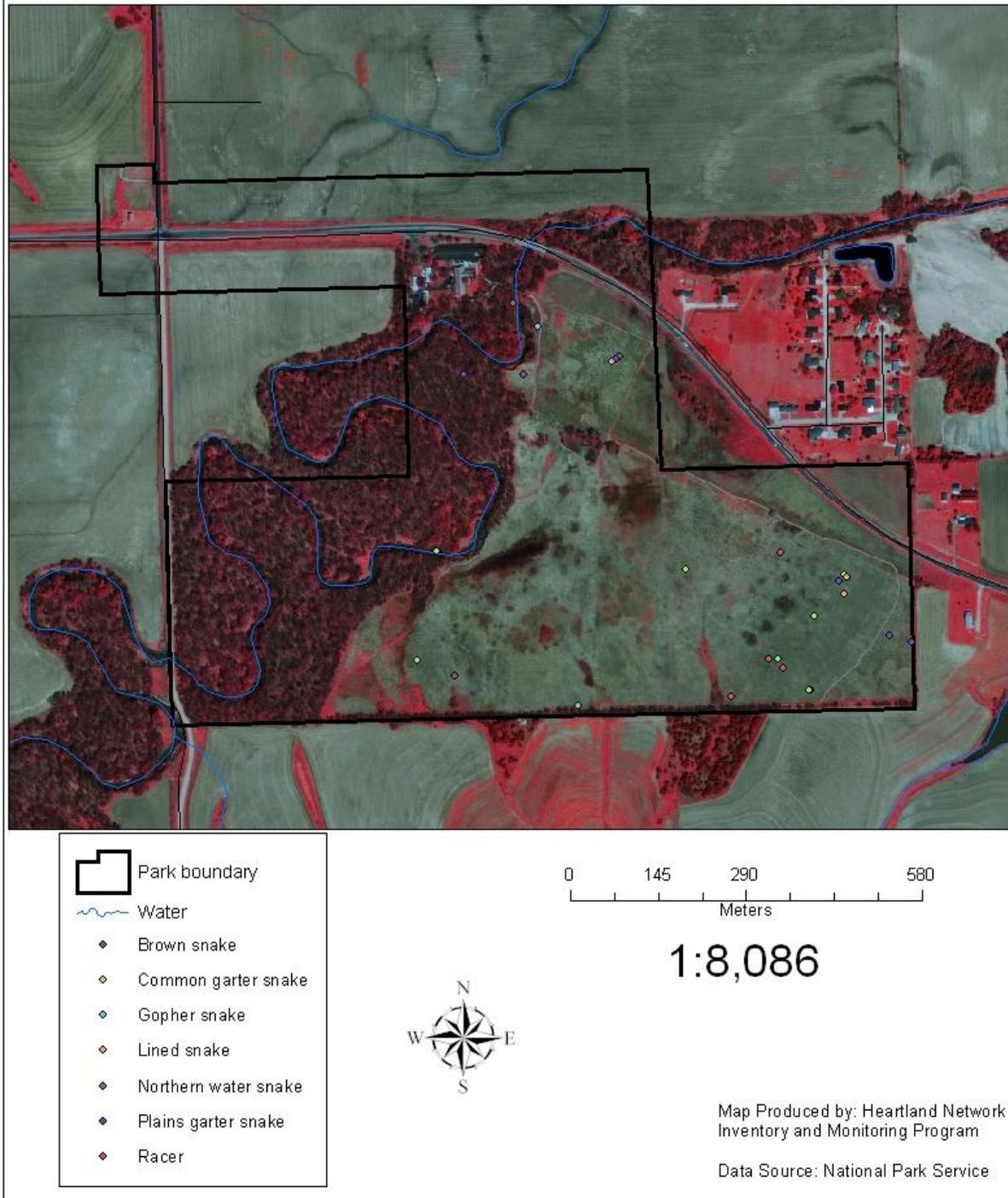
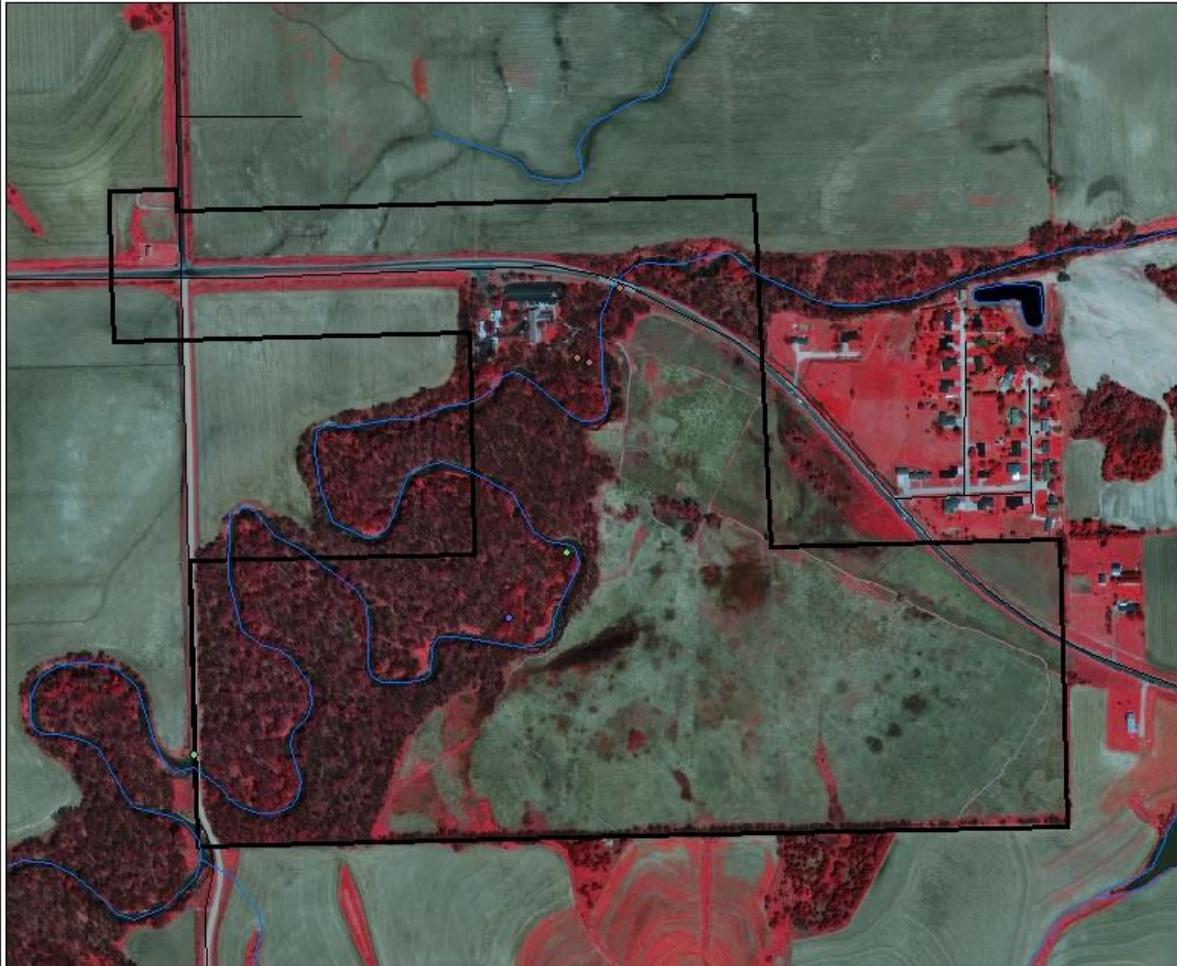


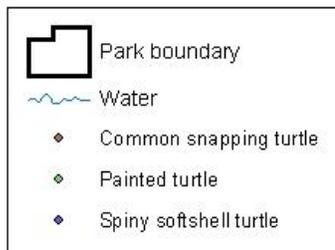
Figure 5. Distribution of snakes documented at Homestead NM of America.

Homestead NM of America



0 145 290 580
Meters

1:8,086



Map Produced by: Heartland Network
Inventory and Monitoring Program

Data Source: National Park Service

Figure 6. Distribution of turtles documented at Homestead NM of America.

Table 1. List of amphibian and reptilian expected and current status at Homestead NM of America.

Amphibian	Family	Scientific Name	CommonName	Old	New	Voucher
Order Anura	Bufonidae	<i>Bufo cognatus</i>	Great plains toad	1	4	No
		<i>Bufo debilis</i>	Green toad	1	0	No
		<i>Bufo woodhousii</i>	Woodhouse's toad	1	2	Yes
	Hylidae	<i>Acris crepitans</i>	Cricket frog	1	2	Yes
		<i>Hyla chrysoscelis</i>	Cope's Gray treefrog	1	2	Yes
		<i>Pseudacris triseriata</i>	Western chorus frog	1	2	Yes
	Microhylidae	<i>Gastrophryne olivacea</i>	W. narrowmouth toad	1	0	No
	Ranidae	<i>Rana blairi</i>	Plains leopard frog	1	2	Yes
		<i>Rana catesbeiana</i>	Bullfrog	1	2	Yes
Order Caudata	Ambystomatidae	<i>Ambystoma tigrinum</i>	Eastern tiger salamander	1	?	No
Reptile	Chelydridae	<i>Chelydra serpentina</i>	Snapping turtle	1	2	Yes
Order Chelonia	Emydidae	<i>Chrysemys picta</i>	Painted turtle	1	2	Yes
		<i>Terrapene ornata</i>	Ornate box turtle	1	0	No
	Trionychidae	<i>Apalone mutica</i>	Smooth softshell	1	1	No
		<i>Apalone spinifera</i>	Spiny softshell	1	2	Yes
Order Squamata	Anguidae	<i>Ophisaurus attenuatus</i>	Slender glass lizard	1	4	No
	Colubridae	<i>Coluber constrictor</i>	Racer	1	2	Yes
	Natricidae	<i>Nerodia sipedon</i>	Northern water snake	-	2	Yes
		<i>Pituophis melanoleucus</i>	Gopher snake	1	2	Yes
		<i>Storeria dekayi</i>	Brown snake	1	2	Yes
		<i>Thamnophis radix</i>	Plains garter snake	1	2	Yes
		<i>Thamnophis sirtalis</i>	Common garter snake	1	2	Yes
		<i>Tropidoclonion lineatum</i>	Lined snake	1	2	Yes
	Scincidae	<i>Eumeces septentrionalis</i>	Prairie skink	1	?	No
	Teiidae	<i>Cnemidophorus sexlineatus</i>	Six-lined racerunner	1	0	No
	Viperidae	<i>Sistrurus catenatus</i>	Massasauga	1	4	No
	Xenodontidae	<i>Diadophis punctatus</i>	Ringneck snake	1	?	No
		<i>Elaphe obsoleta</i>	Black rat snake	1	0	No
		<i>Lampropeltis calligaster</i>	Prairie kingsnake	1	4	No
		<i>Lampropeltis getula</i>	Common kingsnake	1	4	No
		<i>Lampropeltis triangulum</i>	Milk snake	1	?	No

Old indicates the status prior the inventory, New the status after the inventory, and Voucher indicates whether the author vouchered the species. A "1" indicates an expected species, "2" indicates a documented species, "3" indicates a species not expected but observed, and "4" indicates an extinction or extirpation (Boetsch et al 2000).

Table 2. List of species documented and number observed at Homestead NM of America.

Scientific Name	Common Name	Number
<i>Pseudacris triseriata</i>	Western Chorus Frog	100
<i>Acris crepitans</i>	Northern Cricket Frog	70
<i>Hyla chrysoscelis</i>	Cope's Gray Treefrog	24
<i>Rana blairi</i>	Plains Leopard Frog	18
<i>Rana catesbeiana</i>	Bullfrog	17
<i>Bufo woodhousii</i>	Woodhouse's Toad	10
<i>Thamnophis sirtalis</i>	Common Garter Snake	7
<i>Thamnophis radix</i>	Plains Garter Snake	7
<i>Chrysemys picta</i>	Painted Turtle	5
<i>Coluber constrictor</i>	Racer	5
<i>Chelydra serpentina</i>	Common Snapping Turtle	4
<i>Tropidoclonion lineatum</i>	Lined Snake	4
<i>Apalone spinifera</i>	Spiny Softshell Turtle	4
<i>Storeria dekayi</i>	Brown Snake	3
<i>Pituophis catenifer</i>	Bullsnake	2
<i>Nerodia sipedon</i>	Northern Water Snake	1